

WEATHER AND CIRCULATION OF APRIL 1971

A Generally Cool Month With Temporary Relief From Southwestern Drought

RAYMOND A. GREEN

National Meteorological Center, National Weather Service, NOAA, Suitland, Md.

1. MEAN CIRCULATION

The single band of flat, fast westerlies that prevailed across most of the Pacific in April separated off the coast of North America into a southern branch that formed a trough in the Southwest and a northern branch that made up a blocking ridge in Canada (figs. 1 and 2). Reamalgamation of the branches downstream resulted in a fast confluent flow over the Eastern States. In the Atlantic, the circulation was highly amplified with deep troughs off both coasts and a strong ridge between. It was here that average heights for the month departed most from normal, reaching +100 m in the ridge and -90 m in the mean Low off Spain (fig. 2). Over the eastern Atlantic, as in the eastern Pacific, the westerlies split into branches. These remained separate across Europe and rejoined in Asia.

From March to April, several circulation features apparently retrograded at high latitudes. These included a blocking High that moved from the Beaufort Sea to the East Siberian Sea, a Low from the Gulf of Alaska to the eastern Bering Sea, and another Low from the western Bering Sea to the Sea of Okhotsk. From March to April, strong anomalous height falls occurred over the Beaufort Sea (120 m, fig. 3) where the blocking High of March was replaced by a trough. Another region with apparent retrogression was the Atlantic, where trough-ridge positions were nearly reversed as heights rose as much as 120 m off Newfoundland and fell 110 m off the coast of Spain. Over the United States, height changes were smaller but sufficient to reverse trough-ridge positions over the southern half, resulting in significant changes in the weather.

Average wind speeds in the temperate zone from 35° to 55°N were faster than normal by as much as 8 m/s in the Pacific but were mostly slower than normal over North America and the Atlantic. An increase of blocking over the latter areas, that is best seen in the height change pattern of figure 3, helped to reduce the temperate westerly index (0° westward to 180° long.) to normal for the first time since January.

2. MONTHLY WEATHER

Departures from normal of average temperature in April corresponded rather closely to height departures (figs. 4 and 2). Both were above normal over the northern and central Great Plains and generally below normal else-

where. Islands of above-normal temperatures appeared in the drought areas of New Mexico, central Texas, and southern Florida. In general, the temperature anomalies were small; all were less than 6°F, and no records for average monthly temperature were established. A number of daily records for the month of April or so early or late in the season are listed in table 1.

Compared with March, April was cooler by one or two anomaly classes in the Southwest, where the March ridge was replaced by a trough accompanied by significant height falls (fig. 3). Warming occurred with height rises over the Mississippi Valley as a ridge became established there. It was cooler by a class at several stations along the Atlantic coast where anomalous northerly flow persisted even though average heights rose from March to April.

Precipitation exceeded normal over large sections of the West including central Texas where temporary drought relief came with rains of 2-4 in. (fig. 5). This precipitation was related to the development of a trough in the Southwest (fig. 1) about mid-April. Prior to this development, the precipitation regime resembled that of March (Taubensee 1971). At midmonth, much of the Nation's weather became quite variable as storms entering the Southwest traveled across the country. For the month as a whole, the largest area with less than half the normal April precipitation stretched from the central Great Plains to the central Appalachians. In this region where dry northwesterly flow prevailed aloft (fig. 1), several cities listed in table 2 reported their driest or second driest April of record. Similarly dry areas included the Gulf Coast and Lower Mississippi Valley (which lay beneath the low-latitude ridge), and localities of recent persistent drought, which are more difficult to relate to recent changes of the circulation. This was the 11th consecutive month with deficient precipitation at Fort Myers, Fla., and the seventh such month at San Antonio, Tex. It was the first month since August 1970 that precipitation at Yuma, Ariz. (0.17 in.), was more than normal.

3. WEEKLY CIRCULATION AND WEATHER

Early in April, the circulation and weather were very similar to the averages for March, with a mean ridge and relatively warm dry weather over much of the West and a trough with cool wet weather in the East (fig. 6). On April 1, a deep occluding wave crossed Lake Superior

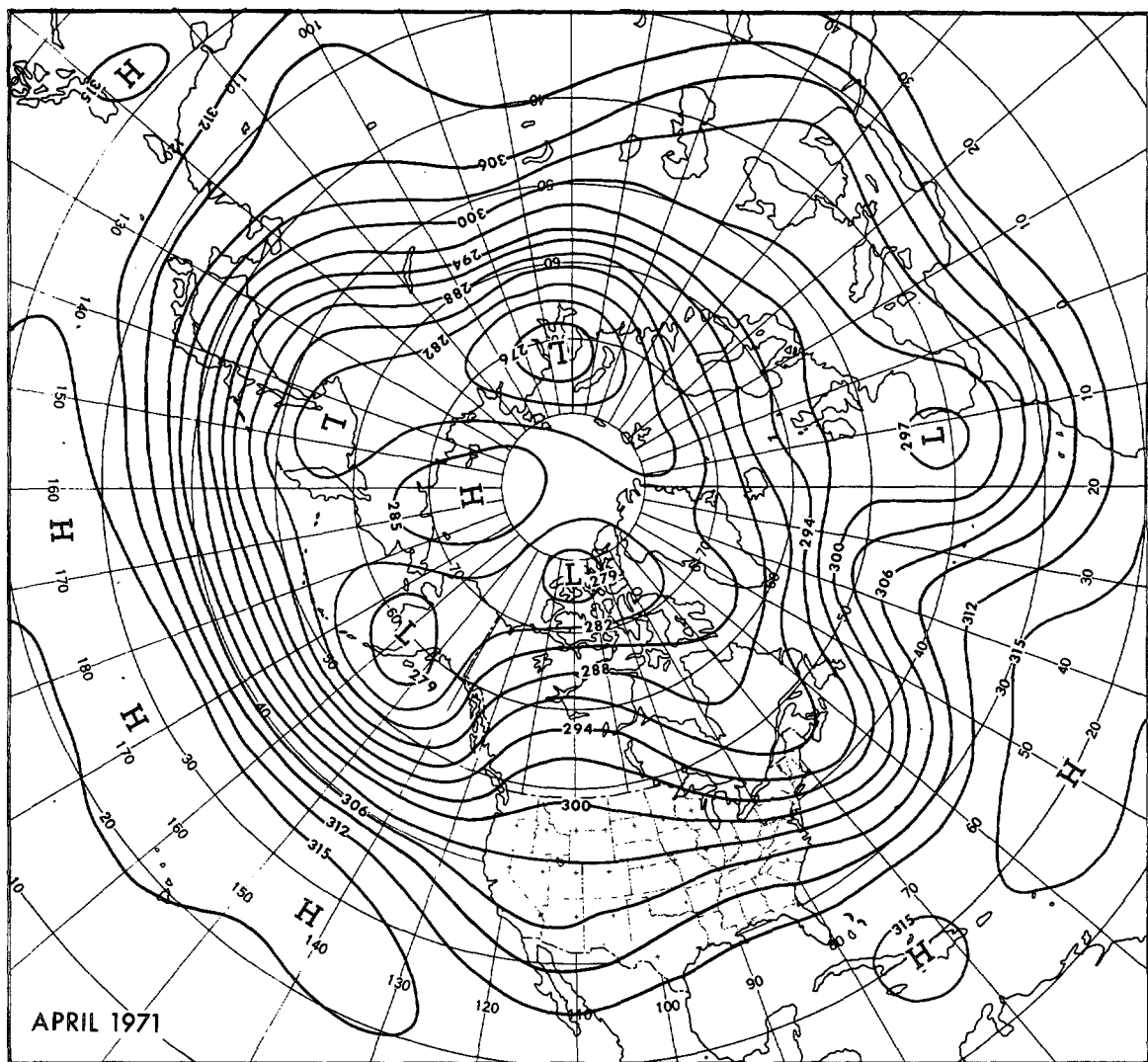


FIGURE 1.—Mean 700-mb contours [dekameters (dam)] for April 1971.

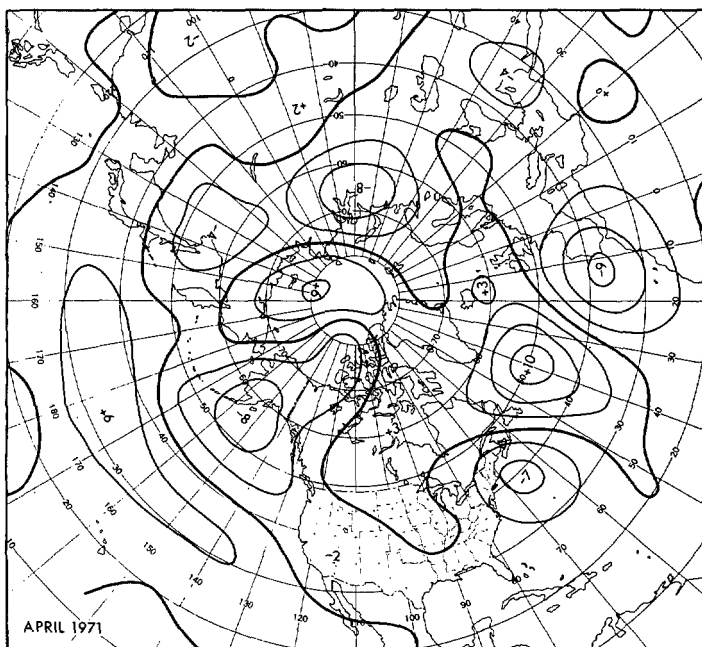


FIGURE 2.—Departure from normal of mean 700-mb height (dam) for April 1971.

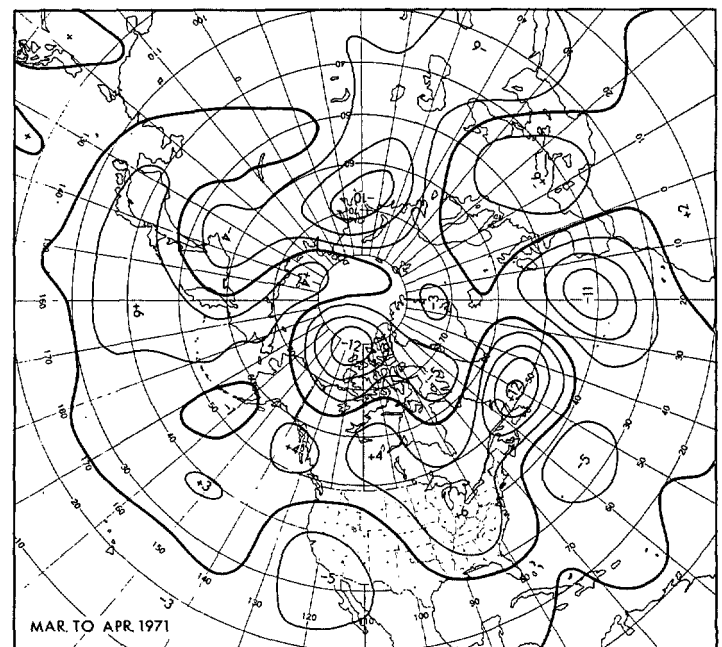


FIGURE 3.—Mean 700-mb height anomaly change (dam) from March to April 1971.

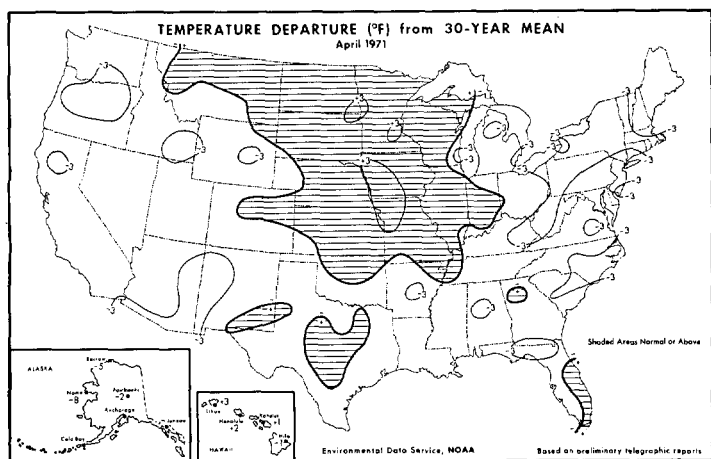


FIGURE 4.—Departure from normal of average surface temperature (°F) for April 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

TABLE 1.—Temperature (°F) records established in April 1971

Station	Temperature	Date	Remarks
International Falls, Minn.	0, -1	4, 5	Lowest so late in season
Duluth, Minn.	2	5	Do.
Bakersfield, Calif.	95	5	Highest so early in season
Fresno, Calif.	92	5	Do.
Little Rock, Ark.	28	7	Lowest so late in season
New Orleans, La.	35, 32, 36	7, 8, 9	Do.
Corpus Christi, Tex.	39	7	Do.
San Antonio, Tex.	29	7	Do.
Miami Beach, Fla.	48	8	Lowest Apr. min.
Tallahassee, Fla.	29, 33	8, 9	Lowest so late in season
Tampa, Fla.	40	8	Do.
Burlington, Vt.	13	17	Do.
Miami Beach, Fla.	94	25	Highest Apr. max.
Pittsburgh, Pa.	24	27	Lowest so early in season
Miami, Fla.	96	30	Highest Apr. max.
West Palm Beach, Fla.	99	30	Do.

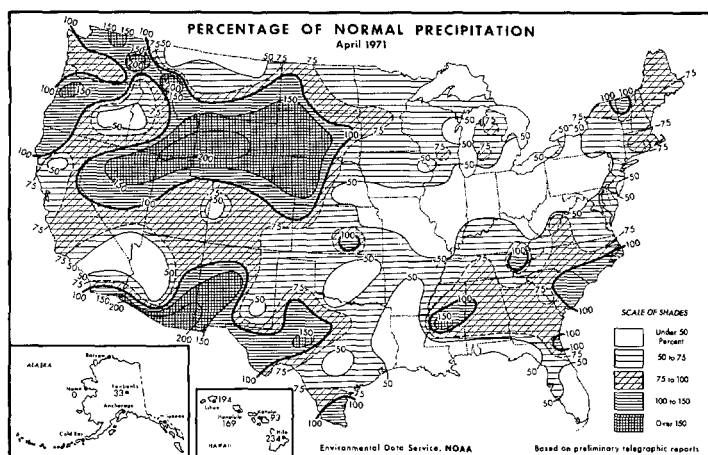


FIGURE 5.—Percentage of normal precipitation for April 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

TABLE 2.—Record and near-record precipitation totals in April 1971

Station	Total	Departure	Remarks
	(in.)	(in.)	
Miami, Fla.	0.07	-3.81	Driest Apr.
Peoria, Ill.	.71	-3.26	2d driest Apr.
Springfield, Ill.	.73	-2.86	Do.
Columbus, Ohio	.52	-2.81	Driest Apr.
Mansfield, Ohio	.75	-2.56	Do.
Elkins, W. Va.	1.02	-2.46	Do.
Parkersburg, W. Va.	1.22	-2.03	2d driest Apr.
Casper, Wyo.	24.2	-----	Most Apr. snow
Lander, Wyo.	45.2	-----	Do.

toward James Bay, accompanied by strong winds that brought visibility to near-zero in blowing snow and dust in parts of the Great Plains. Temperatures dropped rapidly behind the cold front that extended to northern Mexico. In the cold air, International Falls, Minn., reported a minimum of 0°F on April 4, the lowest of record so early in the season.

During April 5-11 (fig. 7), the mean trough that had been along the Mississippi Valley the previous week moved off the Atlantic coast; and the ridge in its wake dominated the circulation over most of the Nation. Temperatures rose markedly in much of the West and the northern Great Plains, but not before new record minima for so late in spring were established at International Falls and Duluth, Minn., on April 5 (table 1). The cold High that produced these low temperatures moved southward and accounted for similar records from Texas to Florida. While most of the Nation enjoyed fair sunny weather, precipitation increased in the Pacific Northwest and Atlantic Coast States. Some rainfall totals were more than 4 in. along the coast of Oregon with the approach of a new Pacific trough. Most of the precipitation in the East was associated with a wave that started over the eastern Gulf of Mexico and moved up the Atlantic Coast. Temperatures over the Southeast were low enough to produce snow from the Ozark Mountains to Tennessee when the surface wave developed off Hatteras while the Low aloft was still west of the Mississippi River.

The circulation became markedly cyclonic the following week in the Far West and Southwest (fig. 8) with cooler and wetter weather over nearly all the West as the eastern Pacific trough came inland. Showers that were generally light, except in central and eastern Texas, provided temporary drought relief from southern California eastward. In Texas, delayed planting activities were expected to resume with the newly increased supply of soil moisture. Much of the Deep South, under a new anticyclonic regime, had no precipitation; reports there of short topsoil moisture were widespread. Temperatures rose to above normal over most of the South and East while warming continued in the Midwest.

Blocking was pronounced over North America during April 19-25 with 700-mb heights above normal over most of Canada and below normal over all but a few North Central States (fig. 9). Average temperatures were lower

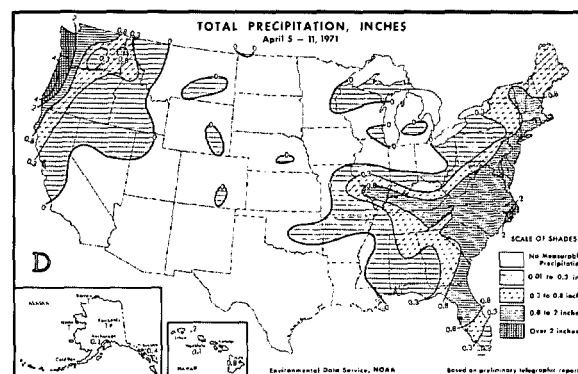
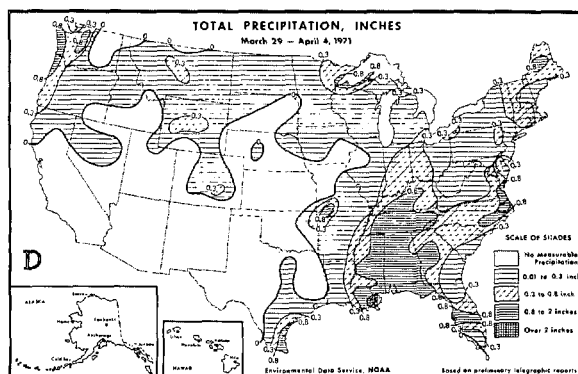
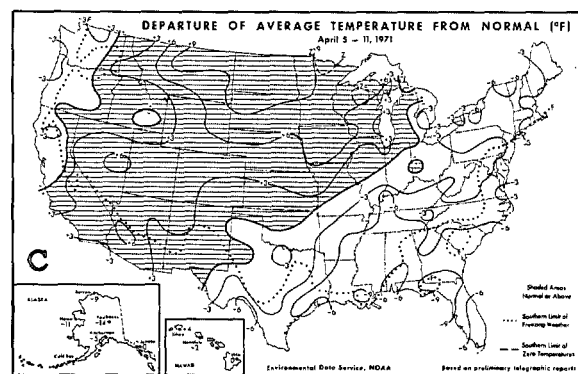
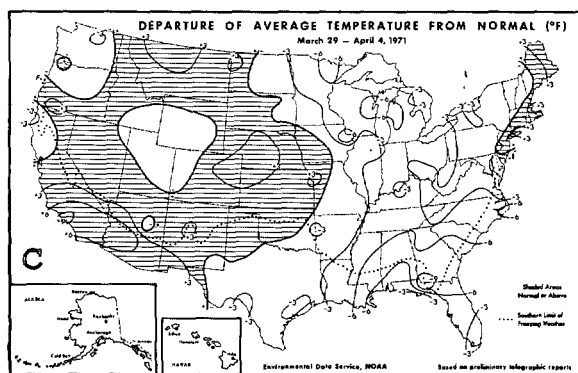
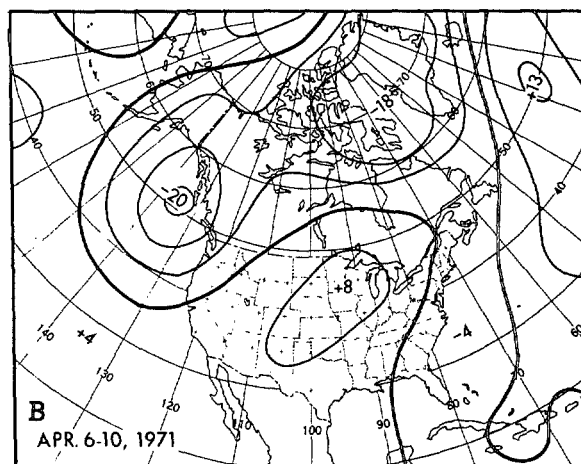
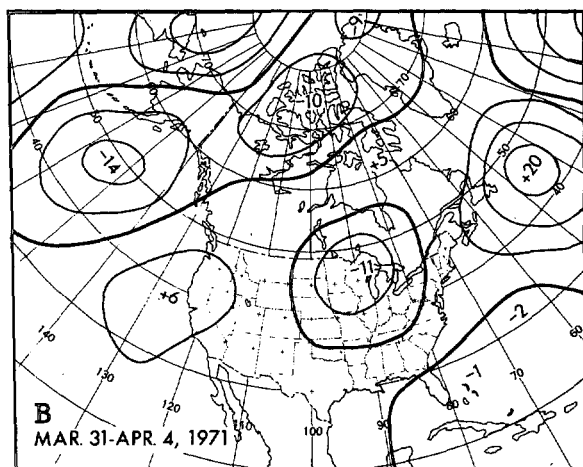
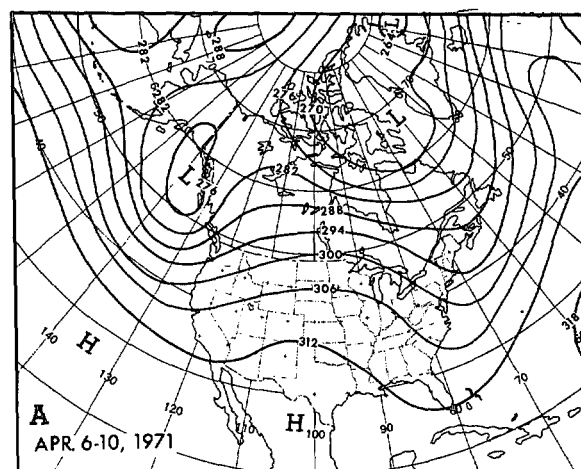
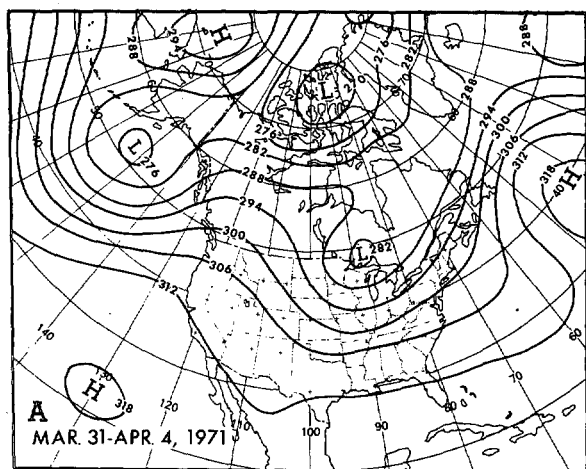


FIGURE 6.—(A) mean 700-mb contours and (B) departure from normal (both in $^{\circ}\text{F}$) for Mar. 31–Apr. 4, 1971; (C) departure from normal of average surface temperature ($^{\circ}\text{F}$) and (D) total precipitation (in.) for week of Mar. 29–Apr. 4, 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

FIGURE 7.—Same as figure 6, (A) and (B) for Apr. 6–10, 1971; (C) and (D) for week of Apr. 5–11, 1971.

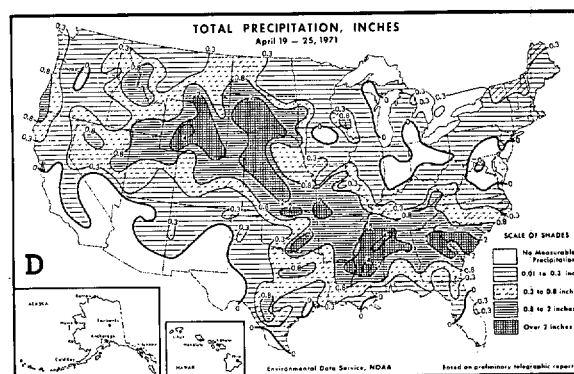
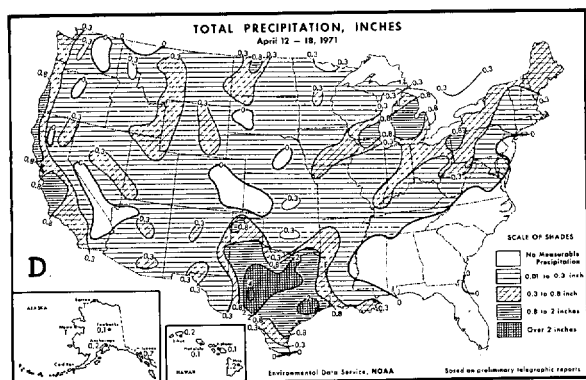
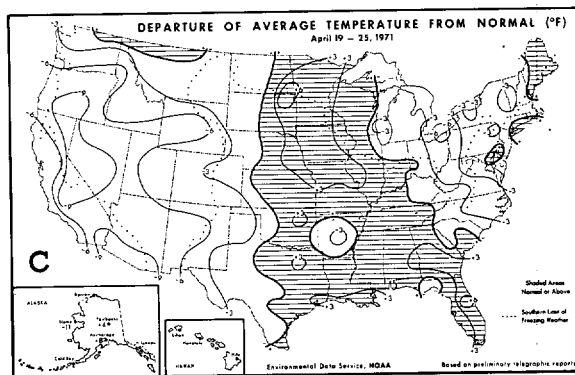
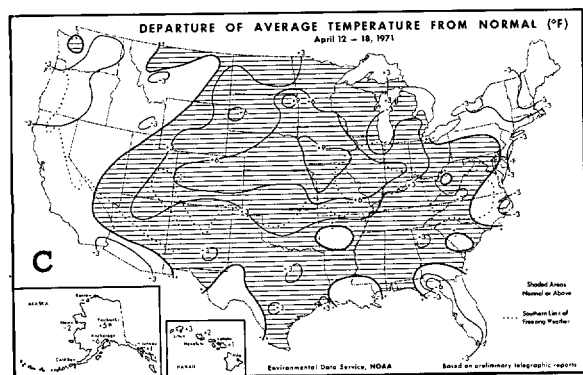
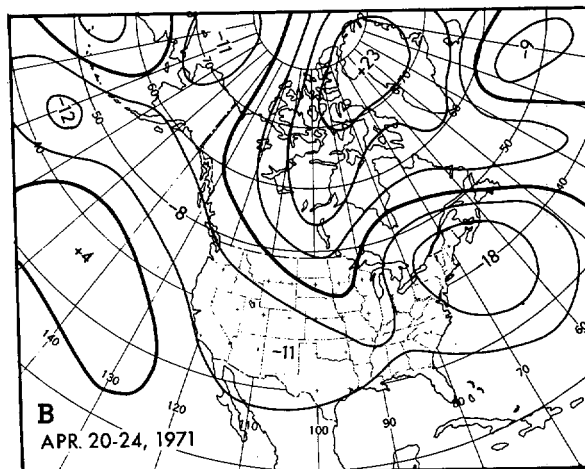
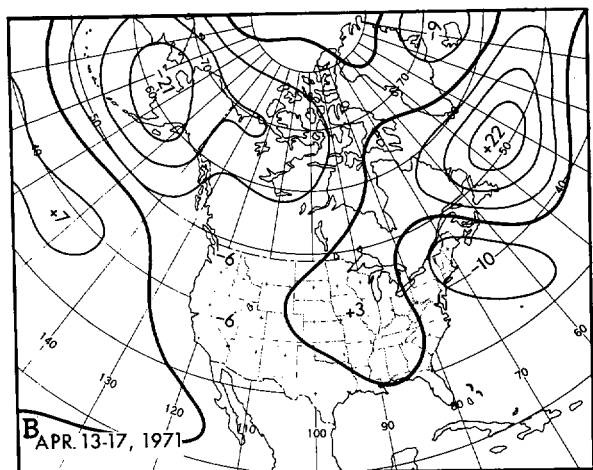
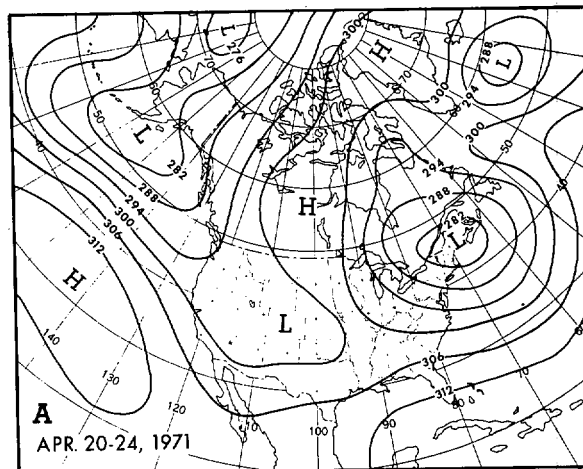
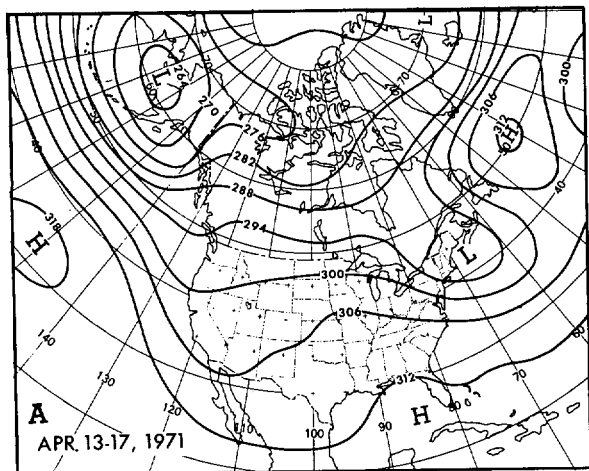


FIGURE 8.—Same as figure 6, (A) and (B) for Apr. 13-17, 1971, (C) and (D) for week of Apr. 12-18, 1971.

FIGURE 9.—Same as figure 6, (A) and (B) for Apr. 20-24, 1971; (C) and (D) for week of Apr. 19-25, 1971.

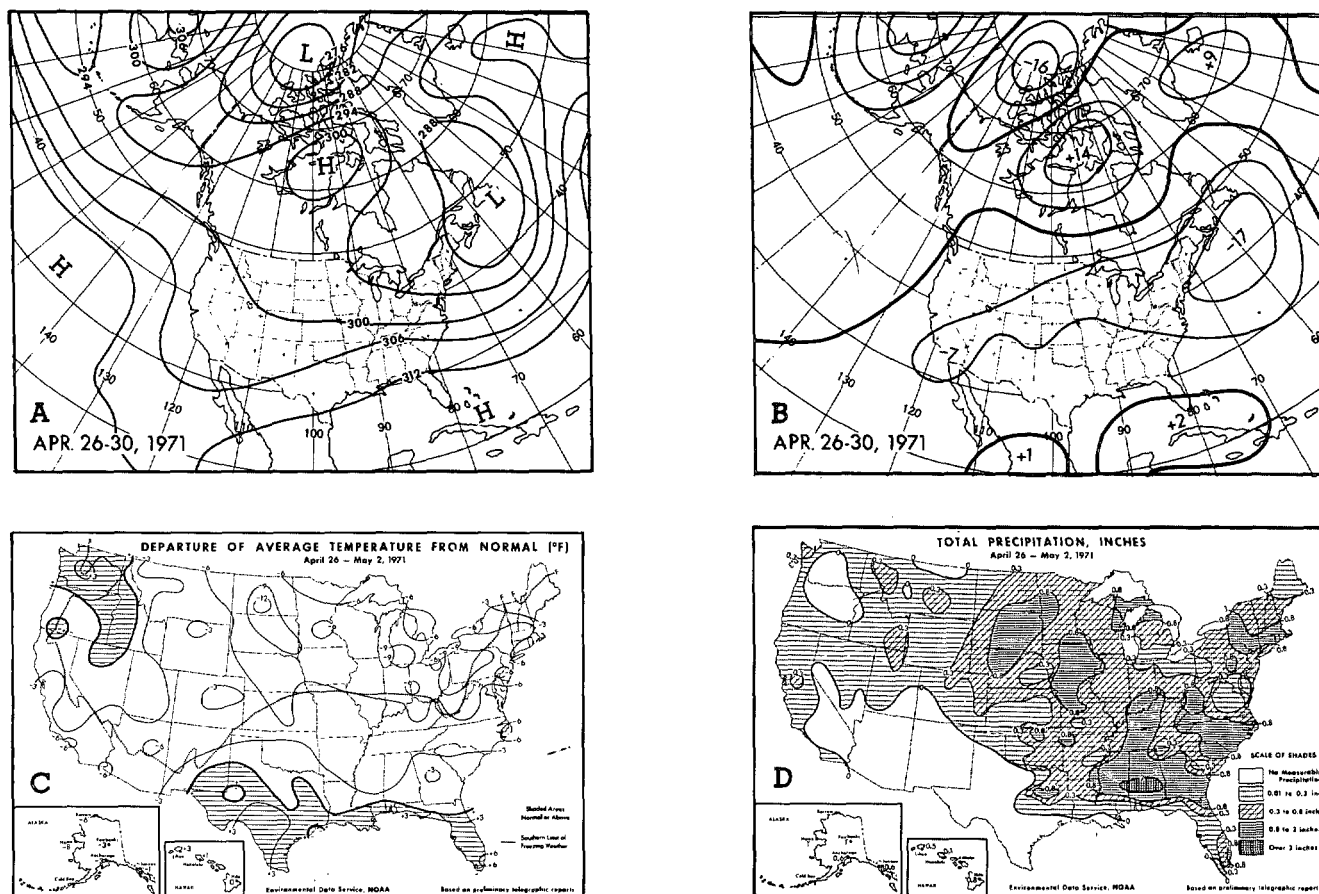


FIGURE 10.—Same as figure 6, (A) and (B) for Apr. 26–30, 1971; (C) and (D) for week of Apr. 26–May 2, 1971.

with respect to normal over most States, and negative anomalies predominated. Some low temperatures included 13°F at Truckee, Calif., 15°F at Bryce Canyon, Utah, and 18°F at Ely, Nev. The first of three southwestern Lows over the central Rockies early in the week caused stormy weather over a wide area, including snow in the Rocky Mountain States ranging from substantial amounts in Wyoming to flurries as far south as El Paso, Tex. Rainfall from the storm was 3.12 in. at La Junta, Colo.; heavy thunderstorms occurred in the Great Plains; and a few tornadoes were reported in western Texas. The second storm was weaker, moved eastward rather than north-eastward, and brought numerous thundershowers and locally severe weather to the Deep South. By the weekend, a third storm was depositing heavy rain and snow in the West. More than a foot of snow fell at Lander, Wyo.; and several inches were reported at other locations nearby. Almost no rain fell from the California deserts to western Texas.

Blocking continued over North America through the last week of April (fig. 10). Anomalies of both height and temperature were negative over most of the United States.

Temperatures averaged 13°F below normal at Bismarck, N. Dak., and more than 9°F below in parts of the Midwest and central Appalachians. Two storms emerged from the Southwest; the first was responsible for snow in Wyoming and Nebraska, thunderstorms in the central and southern Great Plains, and tornadoes in Illinois, Arkansas, Kentucky, and Tennessee. As the month ended, a weak frontal wave drifted eastward along the Gulf Coast. This system produced light showers over southern Florida in early May, but drought remained serious there. Drought continued in the Southwest with no rain reported from the California deserts to central Texas.

REFERENCES

- Environmental Data Service, NOAA, U.S. Department of Commerce, and Statistical Reporting Service, U.S. Department of Agriculture, *Weekly Weather and Crop Bulletin*, Vol. 58, Nos. 14–19, Apr. 5, 12, 19, 26, and May 3 and 10, 1971.
- Taubensee, Robert E., "Weather and Circulation of March 1971—Drought Becomes a Major Concern in the Southwest and in Southern Florida," *Monthly Weather Review*, Vol. 99, No. 6, June 1971, pp. 551–558.